

**REPORT ON METHICILLIN-RESISTANT *STAPHYLOCOCCUS*
AUREUS (MRSA) BLOOD CULTURES IN NORTHERN IRELAND:
APRIL 2002-MARCH 2003 (YEAR 2)**

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REPORT ON METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) BLOOD CULTURES IN NORTHERN IRELAND: APRIL 2002-MARCH 2003 (YEAR 2)

1. Introduction

It is well known that methicillin resistant *Staphylococcus aureus* (MRSA) infections are a problem in hospitals worldwide. Patients who become infected with methicillin resistant strains of *Staphylococcus aureus* (*S aureus*) tend to have more severe infections when compared to those infected with sensitive strains. Their treatment is more expensive, longer, more toxic and can potentially have more side effects. Transmission of MRSA can occur among other patients and staff.

In more general terms, a rise in the prevalence of MRSA strains threatens, through linkage with other resistance genes, to increase the numbers of staphylococci resistant to a range of other currently effective antibiotics, which has obvious implications for treatment of infections. The cost of treating patients would increase, their length of hospital stay could increase and planned hospital activity, e.g. surgery could be disrupted, leading to overall increased costs for healthcare services which are already operating on limited budgets. The level of *S aureus* infections is also considered to be an indicator of hospital-acquired infections in general.

Following the Department of Health (London)'s mandatory requirement for MRSA bacteraemia rates to be reported from 1 April 2001, DHSSPS in Northern Ireland recommended that a similar strategy be introduced in Northern Ireland from April 2002. A preliminary report on the surveillance of MRSA in Northern Ireland from 1 April 2001 – 31 March 2002 was prepared for circulation to all stakeholders, including Consultant Microbiologists, Trust Chief Executives, Infection Control staff and DHSSPS ¹. The scheme formally commenced on 1 April 2002. Data collected on a quarterly basis from 'acute Trusts' have been collated and analysed by CDSC (NI). This report relates to the one-year period April 2002-March 2003.

2. Main Points

Between April 2002 and March 2003 (Year 2), the rate of MRSA patient episodes per 1000 occupied bed days varied from 0.051 to 0.218 for the 1-year period, with an overall rate of 0.119. This compares with an overall rate of 0.125 during the previous year (Year 1). This range is narrower than those recorded in England² and Scotland³ for the same time period (see Table 5).

Rates of *S aureus* patient episodes changed little between Year 1 and Year 2 of the surveillance programme. A slight decrease from 0.308 to 0.304 per 1,000 occupied bed days was observed.

Analysis of these rates should be carried out with caution for the following reasons:

- It cannot be assumed that every isolate is responsible for infection of a patient.
- Data collected on 'patient episodes' should ensure that only one MRSA positive blood culture set from one patient is counted within a 14-day period (this period is arbitrarily considered to represent one episode of disease). **These data are likely to provide a more accurate reflection of the rates of *S aureus* and MRSA bacteraemias.** However, it remains the case that not all cases recorded can be assumed to be true bacteraemias.
- The figure may also include isolates which were acquired before admission to the hospital, either in the community, or in another healthcare institution prior to transfer.
- Patients whose infections were acquired in one hospital, and were subsequently transferred to another hospital, either within the same Trust or to another Trust, may also have been counted more than once.
- Many compounding factors will influence rates within Trusts. For instance, Trusts with different clinical mixes and specialties will have differing proportions of patients at high risk of MRSA infection. For example, a hospital with a specialised renal unit would treat high numbers of patients who are at increased risk of infection and re-infection.
- Episodes of bacteraemia relating to patients resident in non-acute Trusts, eg., in long-stay facilities in community Trusts, may have been omitted from these analyses in some cases. In most cases, such patients would have been transferred to acute Trusts and therefore were counted.

Rates of patient episodes of MRSA bacteraemia decreased in five of the twelve Trusts when compared to Year 1 figures. A similar number showed reductions in rate of *S aureus* patient episodes.

There has been no significant change in the rates of either *S aureus* or MRSA bacteraemia rates at Trust or Northern Ireland level. Changes in rates in individual Trusts may be explained more effectively at a local level.

3. Data Sources and Analyses

Data were collected retrospectively from acute Trusts (see Table 1) and entered into a Microsoft Access 2000 database. Analyses were carried out using Microsoft Access 2000 and Microsoft Excel 2000. The variables and definitions, as previously agreed with data providers, are shown below:

Trust Activity used for calculating rates is defined as the daily average occupied beds (taken from the quarterly KH03A return)

Total *S aureus* BC is defined as the total number of positive BC sets with one or more bottle(s) positive for growth of *S aureus*.

MRSA BC is defined as the total number of *S aureus* BC sets with one or more bottle(s) positive for growth of MRSA.

Total patients with *S aureus* (SA PE) is defined as the total number of patients from whom BC set(s) collected during the quarter grew *S aureus*. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of bacteraemia, then they should be counted as two patients. As an arbitrary measure, if positive blood culture sets are collected more than 14 days apart, they should be considered as reflecting different episodes.

Total patients with MRSA (MRSA PE) is defined as the total number of patients from whom BC set(s) collected during the quarter grew MRSA. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of bacteraemia, then they should be counted as two patients. As an arbitrary measure, if positive blood culture sets are collected more than 14 days apart, they should be considered as reflecting different episodes.

SA CoSurv is defined as the total number of reports of *S aureus* from blood received during the relevant quarter through routine laboratory reporting.

MRSA CoSurv is defined as the total number of reports of MRSA from blood received during the relevant quarter through routine laboratory reporting.

Table 1 Reporting HSS Trusts within Northern Ireland

Trust Name	Hospitals
Altnagelvin Group HSS Trust	Altnagelvin, Spruce House, Waterside
Belfast City Hospital HSS Trust	Belfast City, Belvoir Park
Causeway HSS Trust ^a	Causeway, Robinson Memorial, Dalriada
Craigavon Area Hospital Group HSS Trust	Craigavon Area and PNU, Lurgan, South Tyrone ^b
Down Lisburn HSS Trust	Downe, Lagan Valley
Green Park Healthcare HSS Trust	Forster Green, Musgrave Park
Mater Infirmorum Hospital HSS Trust	Mater Infirmorum
Newry and Mourne HSS Trust	Daisy Hill
Royal Group of Hospitals HSS Trust	Royal Victoria, RBHSC, Royal Maternity
Sperrin Lakeland HSS Trust	Tyrone County, Erne
Ulster Community and Hospitals HSS Trust	Ulster, Bangor, Ards
United Hospitals Group HSS Trust	Antrim, Braid Valley, Moyle, Mid-Ulster, Whitabbey

^a Coleraine and Route Hospitals closed at the end of May 2001, with services being transferred to Causeway Hospital. For simplicity, data were collated under Causeway Hospital for all four quarters.

^b South Tyrone Hospital transferred from Armagh and Dungannon HSS Trust to Craigavon Area Hospital Group HSS Trust in December 2000.

Rates per 1000 occupied bed days were calculated as follows:

$$\text{Trust Rate} = \frac{\text{Numerator, eg, MRSA blood cultures April 2002-March 2003} \times 1000}{\text{Average daily occupied beds} \times 365^*}$$

*365 = number of days from 1 April 2002 to 31 March 2003

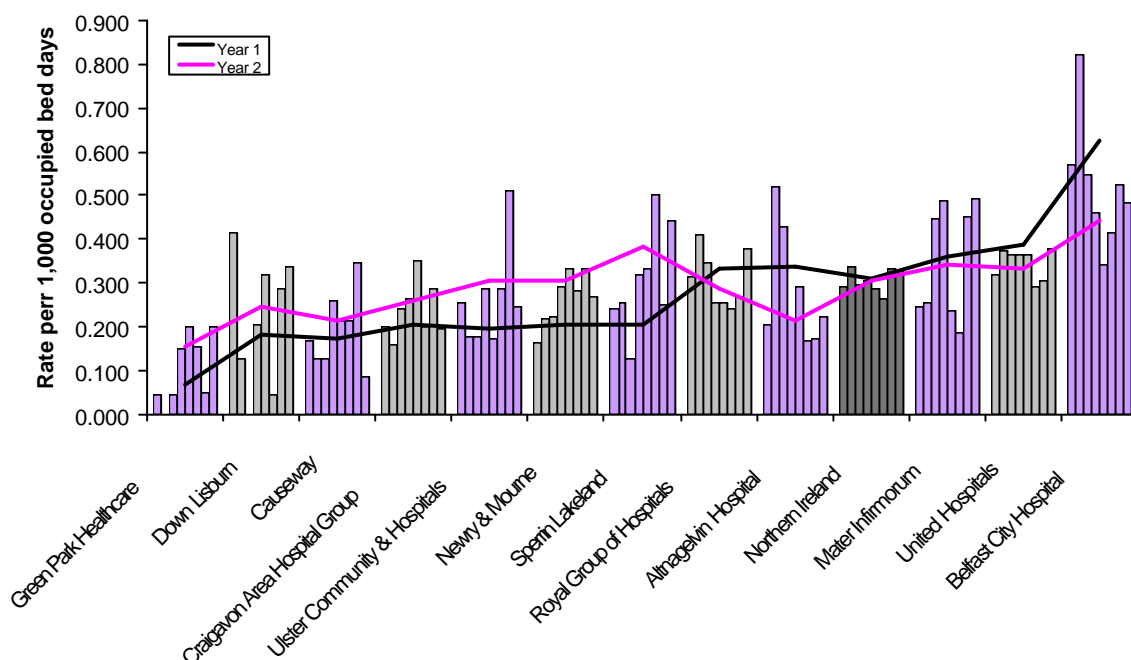
Poisson exact 95% confidence intervals were calculated around each Trust's rate using Microsoft Excel.

4. Results

4.1 *S aureus* Patient Episodes (PE)

- During the surveillance period, 557 episodes of *S aureus* bacteraemia were reported by all Trusts, compared with 563 episodes the previous year (see Table 3).
- The number of episodes of *S aureus* bacteraemia reported by Trusts during the period varied from 12 to 100, a narrower range than was observed during Year 1 (6-135 episodes).
- Trust rates ranged from 0.153 to 0.443 episodes per 1,000 occupied bed days with an overall rate of 0.304 (see Figure 1). This compares with a wider range of 0.07 to 0.625 and an overall rate of 0.308 during the previous year.
- The highest quarterly rate during Year 2 occurred between October and December 2002 ($n=0.334$).

Figure 1 *S aureus* patient episodes rates per 1000 bed days, by Trust and Quarter, April 2001-March 2003, Northern Ireland



Each bar represents sequential quarterly rates from April – June 2001 to January – March 2003. The lines represent overall rates for the periods as specified in the key.

4.4 MRSA patient episodes (PE)

- During the surveillance period, 218 patient episodes of MRSA were reported by all trusts (see Table 4). This compares with a figure of 228 for the previous year (data not shown).
- The number of MRSA patient episodes reported by Trusts during the surveillance period varied between 4 and 46, a narrower range than was observed during Year 1 (2-55 episodes).
- Trust rates ranged from 0.051 to 0.218 episodes per 1,000 occupied bed days, with an overall rate of 0.119 (see Figure 2). This compares with a range of 0.023 to 0.255 and an overall rate of 0.125 during the previous year.
- The highest quarterly rate occurred occurred between January and March 2003 ($n=0.134$; see Figure 3).
- The proportion of *S. aureus* patient episodes which were MRSA ranged from 18% to 63% (see Table 2). The overall Northern Ireland proportion was 39.1%.
- The rate of MRSA patient episodes in Northern Ireland is slightly lower than the rate observed for MRSA bacteraemias in both England and Scotland (see Table 5).

Table 2 Proportion of *S aureus* patient episodes which were MRSA, April 2002–March 2003, Northern Ireland

Trust	<i>Start Quarter</i>	<i>April - June 2002</i>
	<i>End Quarter</i>	<i>January - March 2003</i>
	MRSA/SA %	
Altnagelvin Group	43.33%	
Belfast City Hospital	46.00%	
Causeway	45.00%	
Craigavon Area Hospital	34.04%	
Down Lisburn	38.10%	
Green Park Healthcare	33.33%	
Mater Infirmorum	63.33%	
Newry & Mourne	18.18%	
Royal Group of Hospitals	30.23%	
Sperrin Lakeland Trust	24.32%	
Ulster Community & Hospitals	45.31%	
United Hospitals Group	39.77%	
Northern Ireland	39.14%	

Table 3 Number and Rate of *S aureus* Patient Episodes, April 2002-March 2003, Northern Ireland

Start Quarter April - June 2002
End Quarter January - March 2003

Trust	Organism	Patient Episodes	Rate	Lower CI	Upper CI
Altnagelvin Group	<i>S aureus</i>	30	0.213	0.144	0.305
Belfast City Hospital	<i>S aureus</i>	100	0.443	0.360	0.539
Causeway	<i>S aureus</i>	20	0.216	0.132	0.333
Craigavon Area Hospital Group	<i>S aureus</i>	47	0.258	0.190	0.344
Down Lisburn	<i>S aureus</i>	21	0.247	0.153	0.377
Green Park Healthcare	<i>S aureus</i>	12	0.153	0.079	0.267
Mater Infirmorum Hospital	<i>S aureus</i>	30	0.344	0.232	0.492
Newry & Mourne	<i>S aureus</i>	22	0.305	0.191	0.463
Royal Group of Hospitals	<i>S aureus</i>	86	0.286	0.229	0.353
Sperrin Lakeland Trust	<i>S aureus</i>	37	0.384	0.270	0.529
Ulster Community & Hospitals	<i>S aureus</i>	64	0.307	0.236	0.392
United Hospitals Group	<i>S aureus</i>	88	0.334	0.268	0.412
Northern Ireland	<i>S aureus</i>	557	0.304	0.330	0.279

All rates are per 1000 occupied bed days

Table 4 Number and Rate of MRSA Patient Episodes, April 2002-March 2003, Northern Ireland

Start Quarter *April - June 2002*
End Quarter *January - March 2003*

Trust	Organism	Patient Episodes	Rate	Lower	Upper
Altnagelvin Group	MRSA	13	0.092	0.049	0.158
Belfast City Hospital	MRSA	46	0.204	0.149	0.272
Causeway	MRSA	9	0.097	0.044	0.184
Craigavon Area Hospital Group	MRSA	16	0.088	0.050	0.143
Down Lisburn	MRSA	8	0.094	0.041	0.185
Green Park Healthcare	MRSA	4	0.051	0.014	0.130
Mater Infirmorum Hospital	MRSA	19	0.218	0.131	0.341
Newry & Mourne	MRSA	4	0.056	0.015	0.142
Royal Group of Hospitals	MRSA	26	0.086	0.056	0.127
Sperrin Lakeland Trust	MRSA	9	0.093	0.043	0.177
Ulster Community & Hospitals	MRSA	29	0.139	0.093	0.200
United Hospitals Group	MRSA	35	0.133	0.093	0.185
Northern Ireland	MRSA	218	0.119	0.136	0.104

All rates are per 1000 occupied bed days

Table 5 MRSA patient episode rates (Northern Ireland) and MRSA bacteraemia rates (England and Scotland) per 1000 bed days, April 2002 – March 2003

	Overall Rate	Lowest Trust Rate	Highest Trust Rate
Northern Ireland	0.12	0.05	0.20
England ²	0.17	0.00	0.49
Scotland ³	0.17	0.00	0.33

Note:

The figures quoted for England were based on rates in 177 acute Trusts, and refer to the same time period. The hospital activity (denominator) refers to the time period April 2001 – March 2002. Figures for Scotland were based on 14 acute Trusts, one Health Care Trust and three island Boards, and refer to the same period of surveillance. Data for Scotland were taken from the routine laboratory reporting scheme.

Figure 2 Rate per 1000 bed days of MRSA patient episodes by Trust with 95% confidence intervals, April 2002 – March 2003, Northern Ireland

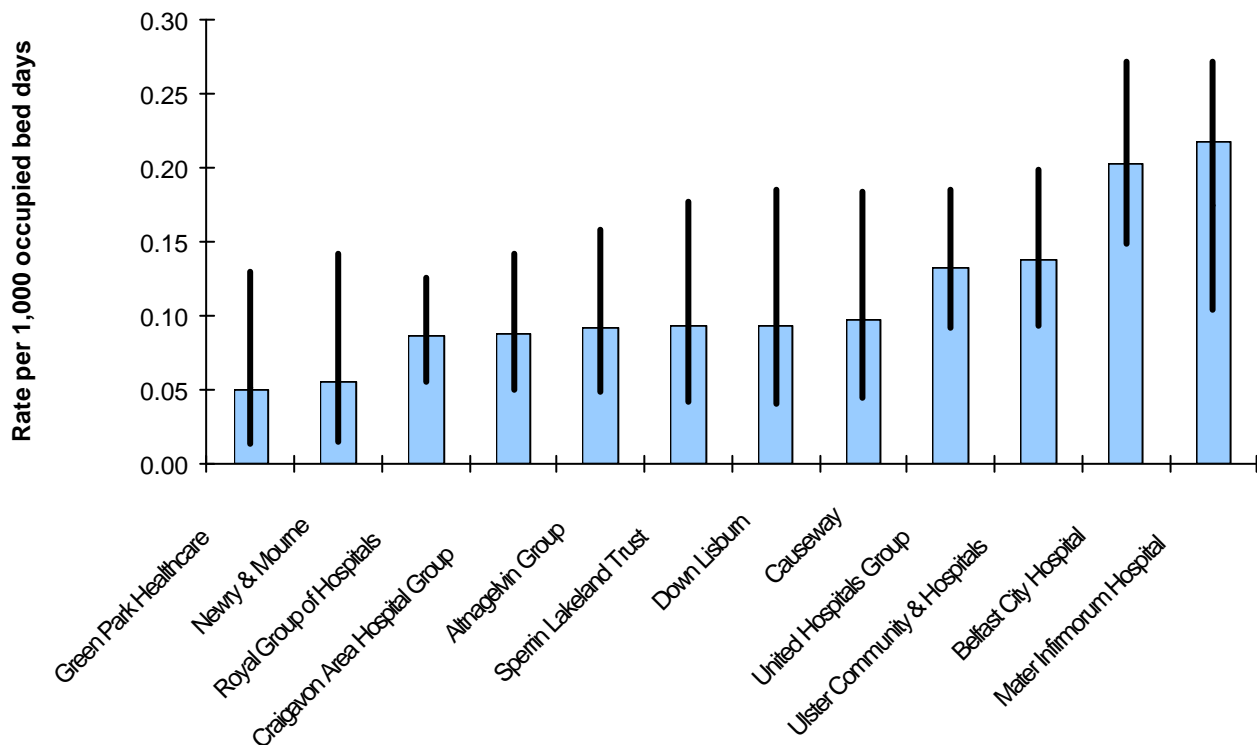
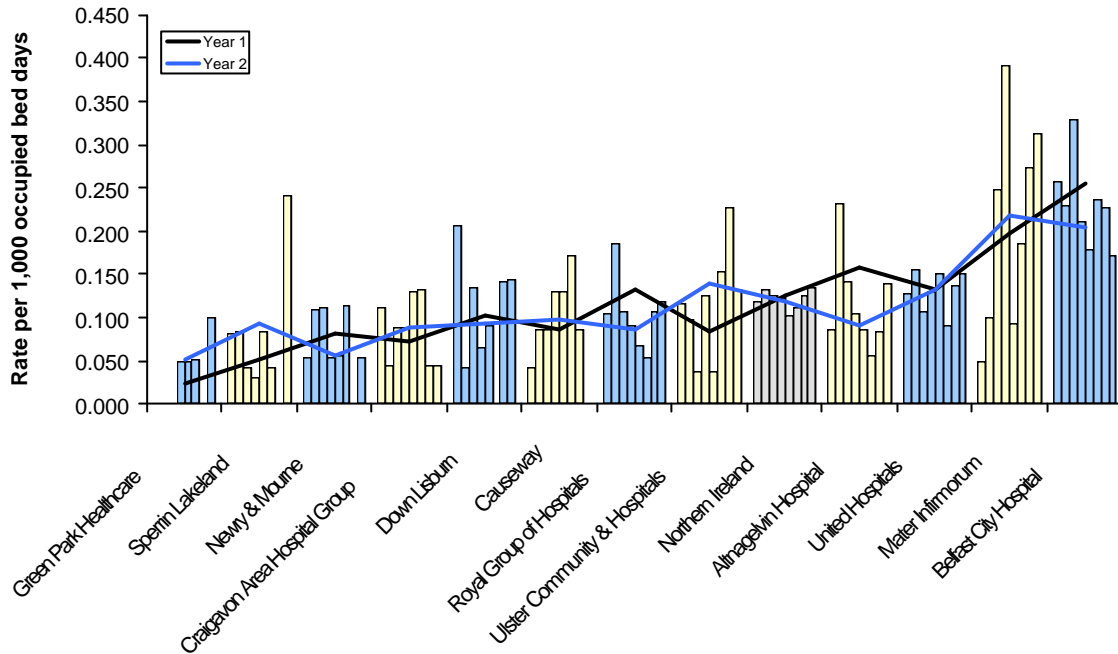


Figure 3 MRSA patient episode rates per 1000 bed days, by Trust and Quarter, April 2001-March 2003, Northern Ireland



Each bar represents sequential quarterly rates from April – June 2001 to January – March 2003. The lines represent overall rates for the periods as specified in the key.

4.5 Routine Laboratory Reports

Data reported through mandatory MRSA bacteraemia surveillance and routine voluntary laboratory reporting (CoSurv) were compared over the same time period. Data relating to routine laboratory reports could only be collected by reporting laboratory; however, further information was requested in order to more closely relate these data to those submitted by Trusts. Currently, three laboratories in Northern Ireland have CoSurv Laboratory Module installed and are reporting electronically to CDSC (NI). Electronic reporting has led to more detailed information regarding patient, hospital and organism data being available, and it is hoped that routine reporting can be used to carry out mandatory *S aureus* surveillance in the future⁴.

When rates of *S aureus* and MRSA bacteraemia were compared using the results of mandatory surveillance and routine laboratory reporting, there is a slight discrepancy between rates. In a number of Trusts, numbers are small, and so differences in rates reflect only a small change in numbers.

Table 6 Rates of Patient Episodes reported through mandatory reporting and routine laboratory reporting by Trust and Organism

*Start Quarter April-June 2002
End Quarter January-March 2003*

Trust	Organism	RATES	
		Patient Episode	CoSurv
Altnagelvin Group	MRSA	0.092	0.107
Belfast City Hospital	MRSA	0.204	0.182
Causeway	MRSA	0.097	0.054
Craigavon Area Hospital Group	MRSA	0.088	0.104
Down Lisburn	MRSA	0.094	0.047
Green Park Healthcare	MRSA	0.051	0.025
Mater Infirmorum Hospital	MRSA	0.218	0.207
Newry & Mourne	MRSA	0.056	0.056
Royal Group of Hospitals	MRSA	0.086	0.053
Sperrin Lakeland Trust	MRSA	0.093	0.073
Ulster Community & Hospitals	MRSA	0.139	0.115
United Hospitals Group	MRSA	0.133	0.133
Northern Ireland	MRSA	0.119	0.104
Trust	Organism	Patient Episode	CoSurv
Altnagelvin Group	S aureus	0.213	0.199
Belfast City Hospital	S aureus	0.443	0.430
Causeway	S aureus	0.216	0.205
Craigavon Area Hospital Group	S aureus	0.258	0.269
Down Lisburn	S aureus	0.247	0.223
Green Park Healthcare	S aureus	0.153	0.114
Mater Infirmorum Hospital	S aureus	0.344	0.321
Newry & Mourne	S aureus	0.305	0.278
Royal Group of Hospitals	S aureus	0.286	0.226
Sperrin Lakeland Trust	S aureus	0.384	0.176
Ulster Community & Hospitals	S aureus	0.307	0.259
United Hospitals Group	S aureus	0.334	0.300
Northern Ireland	S aureus	0.304	0.266

*Although not all laboratories report electronically through CoSurv Laboratory Module, results reported by all laboratories are entered onto a CoSurv Regional Module at CDSC (NI)

5. Discussion Points

5.1 MRSA/*S aureus* patient episodes

- The overall numbers of *S aureus* and MRSA patient episodes have shown a decrease from Year 1. By contrast, increases of 2.9% and 1.4% respectively were observed in England.
- It remains the case that quarterly variation of rates of patient episodes at Trust level is unlikely to be seasonal, and is more likely to be affected by local issues such as ward closures/openings, surgical programmes and outbreaks.
- In general, Trusts where *S aureus* rates have been consistently lower, there has been an increase in rates between Year 1 and Year 2 of the surveillance programme (See Figure 1).
- In general, Trusts which recorded higher *S aureus* rates during Year 1 have shown a decrease in quarterly rates during Year 2.

5.2 MRSA/*S aureus* routine voluntary reporting

- Figures for routine laboratory reports of MRSA and *S aureus* blood cultures are slightly lower than those recorded for mandatory reporting. This was also the case in Year 1.
- The proportion of MRSA/*S aureus* for each method of measurement was similar during Year 1. For instance, the Northern Ireland proportions of MRSA/*S aureus* for patient episodes and routine reports are 39.1% and 39.0% respectively.

6. Final Comments

The results presented here relating to Year 2 of the mandatory MRSA surveillance scheme show that the overall Northern Ireland rate of MRSA bacteraemias has shown a slight reduction when compared with Year 1. Quarterly rates have remained relatively stable. Trusts with figures at the higher end of the range of rates have generally shown an improvement in their figures.

Results need to be viewed with **extreme caution**. The following points should be noted:

- MRSA patient episode rates are **not** a direct measure of MRSA bacteraemia rates, since no clinical assessment has been taken into account.
- Trusts with different clinical mixes and specialties will have differing proportions of patients at high risk of MRSA infection. For example, Trusts which accommodate higher numbers of intensive care beds would be expected to have higher rates, since data suggest that 30% of all hospital-acquired bacteraemias occur in intensive care unit (ICU) patients⁵.
- Reports of MRSA patient episodes from a Trust may relate to patients who became infected in, and were reported by, another Trust. Since data are collected without patient identifiers, the removal of duplicates is not possible.
- Data collected on patient episodes should ensure that only one MRSA positive blood culture set from one patient is counted within a 14-day period. These data are more likely to provide a more accurate reflection of the rates of *S aureus* and MRSA bacteraemias.
- Episodes of bacteraemia relating to patients resident in non-acute Trusts, e.g. in long-stay facilities in Community Trusts, may have been omitted from these analyses. In other cases, such patients may have been transferred to acute Trusts and therefore were counted.
- Detailed interpretation of these results can only be provided at Trust level, particularly with regard to quarterly variation within Trusts (see Figure 2).

Abbreviations

Surveillance period	1 April 2002 – 31 March 2003
BC	Blood culture (see definitions)
<i>S aureus</i>	<i>Staphylococcus aureus</i>
MRSA	Methicillin resistant <i>Staphylococcus aureus</i>
+ve	culture positive
CDSC (NI)	Communicable Disease Surveillance Centre (Northern Ireland)
DHSSPS	Department of Health, Social Services and Personal Safety
PE	Patient Episode (see definitions)
SA BC	<i>Staphylococcus aureus</i> blood culture

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